DOCUMENT RESUME

ED 457 730 HE 034 379

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TITLE Tuition Increases, Demand and Academic Performance. AIR 2001 Annual Forum Paper.
PUB DATE 2001-06-00
NOTE 17p.; Paper presented at the Annual Meeting of the Association for Institutional Research (41st, Long Beach, CA, June 3-6, 2001).
PUB TYPE Numerical/Quantitative Data (110) -- Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Costs; Economic Factors; Educational Trends; *Enrollment; Higher Education; *Tuition
IDENTIFIERS University of Hawaii

ABSTRACT

A study of the trends related to demand and academic performance at an 11-campus higher educational system, the University of Hawaii system, was conducted over a 14-year period during which tuition increased at varying rates. The results indicate the presence of tuition-dollar thresholds that constitute the financial tolerance level beyond which demand starts to decrease. In this study, the threshold in tuition-increase tolerance levels seemed to be around $240 for the community colleges and around $750 for the senior institution. The study also identified specific and similar levels in several educational performance indicators, suggesting that performance improves as tuition increases. The relationship between demand and performance trends is discussed. (Contains 21 figures and 11 references.) (SLD)

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Tuition Increases, Demand and Academic Performance

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Paper presented at the 41st Annual Meeting of the Association for Institutional Research, Long Beach, CA, U.S.A., May 2001.

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ABSTRACT

A study of the trends related to demand and academic performance at an eleven-campus higher-educational system was conducted over a 14-year period during which tuition increased at varying rates. The results indicate the presence of tuition-dollar thresholds that constitute the financial tolerance level beyond which demand starts to decrease. The study also identified specific and similar trends in several educational performance indicators, suggesting that performance improves as tuition increases. The relationship between demand and performance trends is discussed.

INTRODUCTION

During the 1990s, tuition at the University of Hawaii system, a publicly-funded institution, increased rapidly as the state's financial condition deteriorated, leading to a series of cuts in state funding (Healy, 1997). Concerns were expressed about the impact of this increase on enrollment and performance. These concerns are not unfounded, as the literature on the impact of tuition increases is inconclusive. Some studies report that enrollment increases as tuition increases (Waters, 1969, and Virginia State Dept. of Community Colleges, 1993). Others find that enrollment is not impacted by tuition increases (Hauptman and Krop, 1998, Virginia Community College, 1993). Still others (National Association of State Universities and Land Grant Colleges, 1983) make the case that tuition increases hinder access to education. Some administrators (Evengelauf, 1987) go as far as suggesting that the quality of education is judged by its price, and that low prices do not necessarily imply good management.

The purpose of this study is to investigate the impact of tuition increases on demand and performance at the University of Hawaii system. The University of Hawaii system comprises 11 campuses: seven (two-year) community colleges, three (four-year and graduate-program) senior institutions, and a training center. This study is limited to a comparison of the 7 community colleges combined (regular-student enrollment 25,000), offering liberal arts and vocational programs and charging the same tuition, and only the largest of the senior institutions,* (the Manoa campus, regular-student enrollment: 17,000), for which tuition is significantly higher than that at the community colleges.

METHODOLOGY

Data were collected for the academic years 1985 through 1998. Prior to 1985, tuition increases were small enough to be negligible. For purposes of this study, this was a fortuitous time in which a combination of factors contributed to making this institution a uniquely suitable laboratory for this type of study. Some of these factors are:

1. Between 1985 and 1995, tuition increased slowly, starting at $115 and $425 per semester at the community colleges and the senior institution, and reaching $240 and $730 respectively (Table 1 and Figure 1). After that eleven-year period, three sharp tuition increases occurred during three successive academic years, between 1996 and 1998, and translated into large

* Because of location, tuition differences and other variables, the two other senior institutions were excluded from the study.

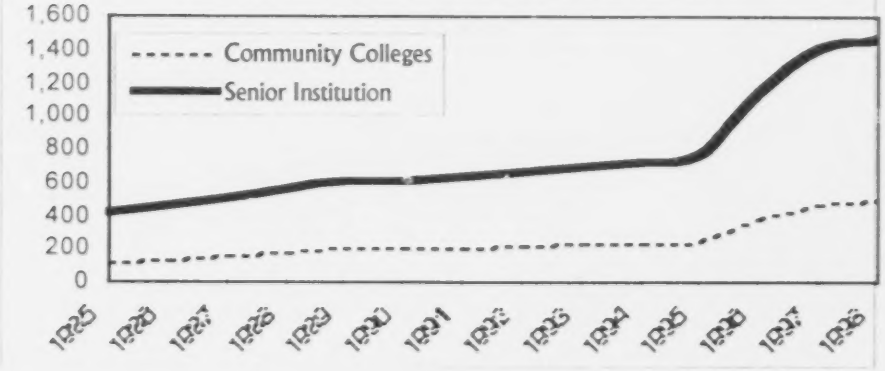
percentage increases: by 1998, tuition reached $492 and $1,464, reflecting a 95% and 91% increase, respectively, in three short years.

Table 1
Full-Time Undergraduate Semester Resident Tuition [1]

AY	Community Colleges	Senior Institution
1985 - 86	115	425
1986 - 87	135	470
1987 - 88	155	515
1988 - 89	175	565
1989 - 90	200	615
1990 - 91	200	615
1991 - 92	210	645
1992 - 93	220	670
1993 - 94	230	700
1994 - 95	240	730
1995 - 96	252	767
1996 - 97	384	1,152
1997 - 98	468	1,416
1998 - 99	492	1,464

(1) Fees other than tuition are excluded.

Figure 1
Full-Time Undergraduate Semester Resident Tuition



2. The relatively large size of the eleven-campus system allows for the study of the impact of tuition increases on the community colleges and the senior institutions separately, as well as on transfer patterns between the two types of institutions, which have vastly different tuition.

3. The data were collected for a period of relatively stable economic condition, which comprised the tail end of an economic boom followed by a mild and stable recession, all accompanied by a relatively low inflation rate.

The university is also uniquely situated in terms of incentives for mobility: the geographically-remote location of the islands and the Asian-influenced cultures that strongly value family ties are deterrents to mobility. As a result, this study illustrates the behavior of a somewhat captive student population.

Data on highly-competitive programs of study, such as Nursing, Medicine and Law, were excluded. Only Liberal Arts community-college students and Arts and Sciences senior-institution students were included in the study. Also, only resident students were considered, and were divided into three groups: 1) community college; 2) lower division at the senior institution, consisting of the first two years (freshmen and sophomores); and 3) upper division, which consist of the last two years at the senior institution (juniors and seniors). Demand data were gathered only on the first two categories of students, the assumption being that the demand by upper-division students, well into their academic life, is less impacted by tuition increases. With performance data, it was assumed that increased tuition would raise the cost of failure, thereby impacting upper-division students as well. As a result, senior-institution indices such as graduation rates were used.

The following demand and performance indices were used.

Demand. Five fall-semester indices were studied as measures of demand:

1. *Applications*: the number of students applying for enrollment. At both institution types, resident-student applications are free. For the senior institution, only undergraduate applications were considered, since graduate applications have little elasticity with respect to tuition increases.

2. *Enrollment*: the headcount of Liberal Arts students (community colleges) and lower-division students (senior institution) who were enrolled for at least one course unit.

3. *Registrations*: the number of courses in which the same categories of students were enrolled.

4. *Student-Semester Hours*: the number of course units in which the same categories of students were enrolled.

5. *Transfers* between the senior institution and the community colleges. These transfers constitute only a part of the total transfer picture at both types of institutions, as transfers occur between each one of them and several other sources.

Performance. Four annual indices were studied as measures of performance:

1. *Grade-Point Ratios*, also known as grade-point averages, obtained by calculating the weighted mean grades based on the following letter grades and their corresponding weights: A=4, B=3, C=2, Cr =2, D=1, F=0, NC=0, and W=0.

2. *Credits-Earned Ratios*, calculated as the sum of the A, B, C, D, and Cr (for Credit, given for those who choose Credit versus Non-Credit (NC)) grades, divided by the total number of grades, including W (for Withdraw) but excluding Dr (for Drop, which does not appear on the transcript of grades).

3. *Completion Ratios*, obtained as the ratio of all grades except W divided by the total number of grades, including W but excluding Dr.

4. *Graduations*. Both number of graduates and graduation rates were obtained. Graduation rates were counted as the percent of students graduating to the total number of students enrolled.

RESULTS AND INTERPRETATION

Tuition

The data in Table 1 and Figure 1 indicate that tuition increased at the same rate across institution types. This is not surprising, given that all 11 campuses are governed by the same board. The single largest annual increase for the community colleges was $132 between Academic Year (AY) 1995-6 and AY 1996-7 (a 52% increase). For the senior institution, the largest increase was $385 (a 50% increase), and was synchronous with the largest community-college increase.

Additional perspective of the magnitude of tuition increases can be obtained from a comparison with the national average. Although, in the USA, tuition in the 1990s increased at a faster rate than that of inflation (Hauptman and Krop, 1998), tuition increases at the University of Hawaii system increased at an even faster rate than the national average. In 1992, right before the large tuition increases took place, the community colleges' tuition was 38% of the national average and the senior-institution's tuition was 45% of the national average (University of Hawaii, 1992). By 1998, these percentages increased to 64% and 79%, respectively (University of Hawaii, 1998). For a state in a deteriorating financial condition, these increases clearly posed a burden on many students.

Demand

Graphical representations of all the demand indices (except transfers) as a function of tuition are presented in Figures 2 through 5 for the community colleges and Figures 6 through 9 for the senior institution.* In these figures and all subsequent ones, the abscissa is the semester tuition. The actual data are presented in Tables 2 and 3.

Table 2
Community-College Demand Indicators

AY	Applications	Enrollment	Registrations	Student-Semester Hours
1985 - 86	NA	8,836	41,072	126,164
1986 - 87	NA	9,144	40,769	125,801
1987 - 88	NA	9,940	41,432	129,451
1988 - 89	NA	10,331	41,794	130,908
1989 - 90	13,239	10,976	47,556	138,154
1990 - 91	13,746	11,878	51,650	150,381
1991 - 92	17,476	13,151	51,397	156,675
1992 - 93	19,844	14,258	56,876	165,252
1993 - 94	20,426	14,518	56,975	166,351
1994 - 95	20,773	15,725	59,403	173,818
1995 - 96	19,767	15,151	57,794	170,404
1996 - 97	19,060	14,745	53,748	164,049
1997 - 98	18,904	13,916	52,375	158,890
1998 - 99	18,867	13,713	54,961	160,783

* In these and subsequent graphs, all the data were exponentially smoothed, using a smoothing constant of 0.50.

Figure 2
Community-College Fall Applications

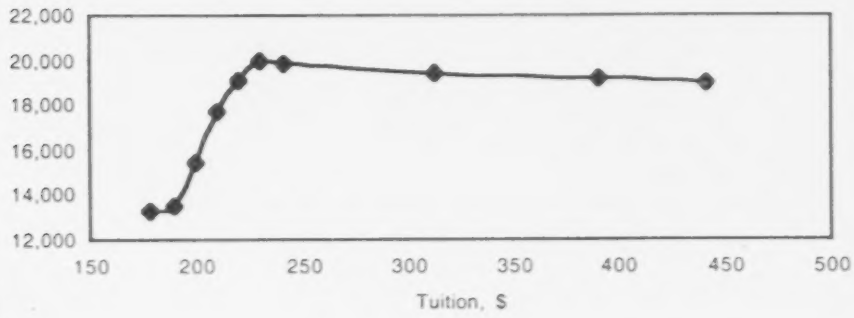


Figure 3
Liberal Arts Fall Enrollment

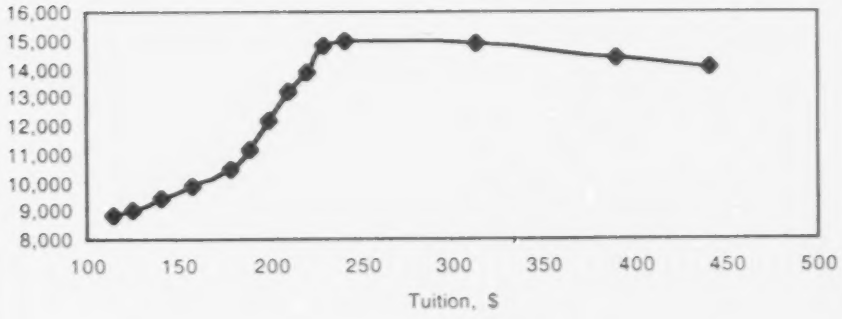


Figure 4
Liberal Arts Fall Registrations

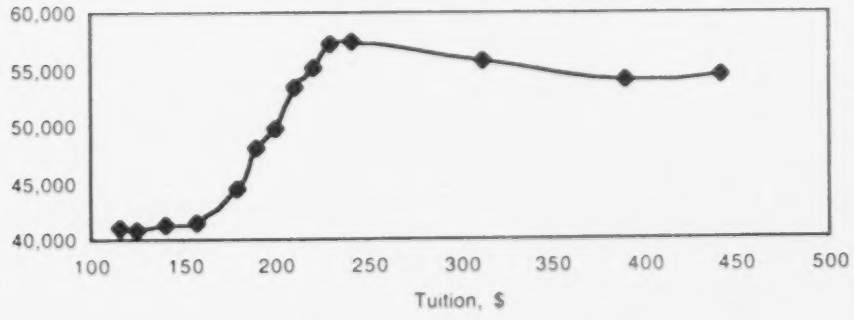


Figure 5
Liberal Arts Fall Student-Semester Hours

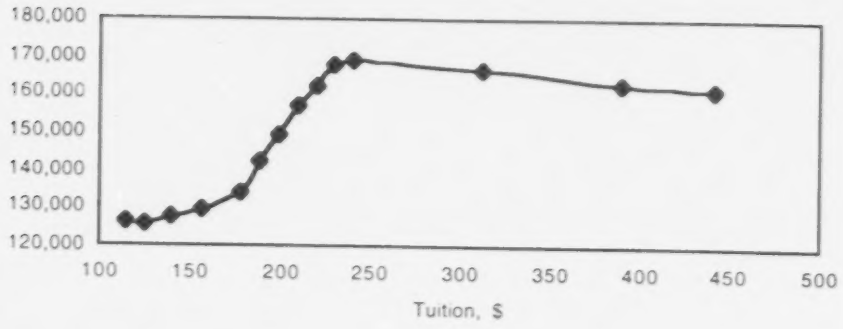


Table 3
Senior-Institution Demand Indicators

AY	Applications	Enrollment	Registrations	Student-Semester Hours
1985 - 86	NA	19,606	19,606	110,629
1986 - 87	NA	18,918	18,918	100,841
1987 - 88	NA	18,382	18,382	97,286
1988 - 89	NA	18,424	18,424	98,804
1989 - 90	8,452	18,546	18,546	98,655
1990 - 91	8,680	18,810	18,810	98,476
1991 - 92	8,421	19,316	19,316	101,332
1992 - 93	8,129	19,810	19,810	101,608
1993 - 94	8,260	20,037	20,037	104,783
1994 - 95	7,231	19,983	19,983	105,114
1995 - 96	8,542	19,757	19,757	105,567
1996 - 97	7,377	18,232	18,232	96,739
1997 - 98	7,333	17,353	17,353	94,147
1998 - 99	7,570	16,996	16,996	91,704

Figure 6
Fall Undergraduate Applications

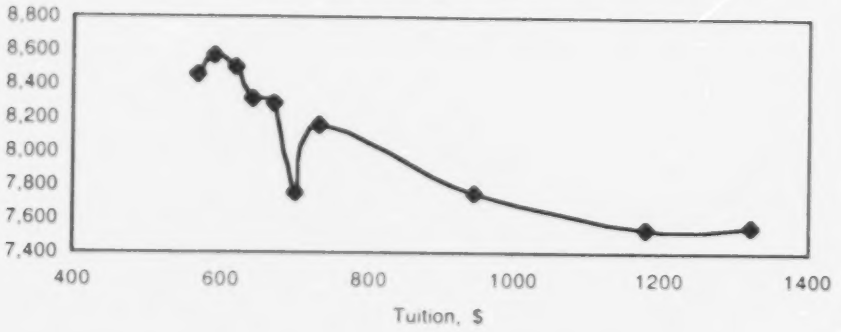


Figure 7
Total Fall Enrollment

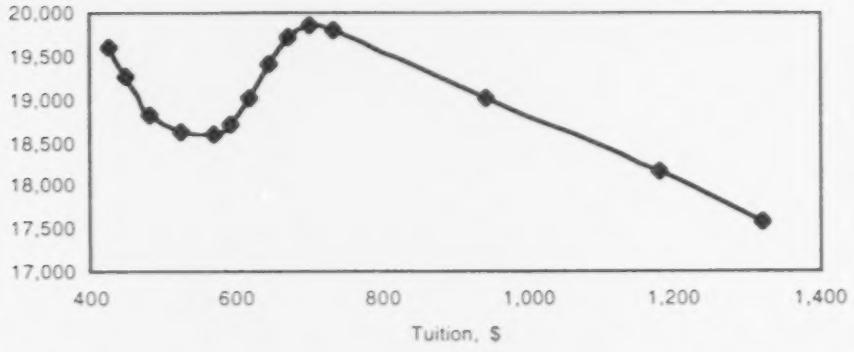


Figure 8
Lower-Division Fall Registrations

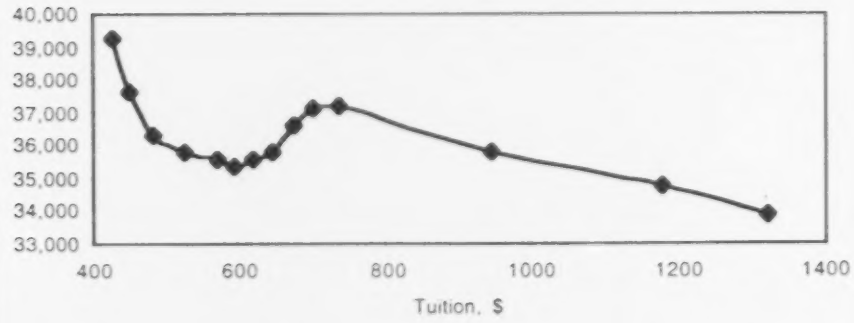
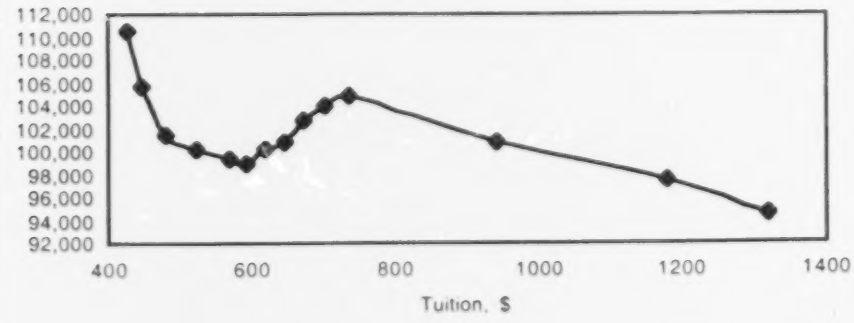


Figure 9
Lower-Division Fall Student-Semester Hours



Community Colleges

The data in Table 2 and in Figures 2 through 5 illustrate a remarkably similar trend: between 1986 and 1994, as tuition increased slowly, demand continued to increase. Then, around roughly the $240 mark, a trend reversal occurred and all demand indicators started to decline. This reversal point coincides with the beginning of the steep tuition increases.

Senior Institution

The data in Tables 3 and in the related figures (6 through 9) indicate a very similar trend with all of the indicators. As tuition increases slowly, demand fluctuates until 1994, when tuition starts to increase sharply and a rapid demand decline occurs around the $750 mark, which also coincides with the beginning of period of sharp tuition increases.

Student Transfer

The transfer patterns to and from the community colleges during the 14-year period under study are presented in Table 4 and illustrated in Figure 10.

Table 4
Transfers of General Education (Arts and Sciences) Majors
Between the Senior Institution and the Community Colleges

AY	From S.I. to C.C.	From C.C. to S.I.	Net to S.I.
1986 - 87	248	713	465
1987 - 88(1)	231	607	376
1988 - 89	215	501	286
1989 - 90	211	454	243
1990 - 91(1)	238	516	278
1991 - 92	204	577	373
1992 - 93	254	572	318
1993 - 94	242	610	368
1994 - 95	304	526	222
1995 - 96	415	604	189
1996 - 97	369	461	92
1997 - 98	294	525	231
1998 - 99	303	521	218

(1) Interpolated

Under difficult financial conditions, lower-division students would be more enticed to transfer to a less-expensive community college to complete their lower-division courses before returning to the senior institution. Given that course articulation is in effect between the two types of institutions, to the student, the absolute difference in tuition dollars between the two types of institutions —rather than the percent increase in tuition— gains in importance as a factor impacting the decision of whether to transfer or not. In this situation, although the tuition at both types of institutions increased by roughly the same proportion, the difference in absolute tuition dollars increased

exponentially. For example, in 1986, the senior-institution tuition was $310 higher than that at the community colleges. By 1992, the difference increased to $450, and by 1998, it reached $972. As the data in Table 4 show, as this absolute difference increased, more students did transfer to the community colleges from the senior institution, thereby decreasing the net gain to the senior institution from this two-way traffic ("Net Gain to S.I." in Table 4). The simultaneous change in these two variables, namely the net transfer gain to the senior institution on one hand, and the difference between tuition at the senior institution and that at the community colleges on the other hand, is shown in Figure 10. This figure vividly illustrates the inverse relationship between the two variables: the decreasing transfer difference with the increasing tuition difference. It can also be seen from the data that transfer from the senior institution to the community colleges has been increasing for the entire period of this study.

Performance

Graphical representations of each of the performance indicators described above as a function of tuition are presented in Figures 11 through 14 for the community colleges and Figures 15 through 20 for the senior institution. The actual data are presented in Tables 5 and 6.

Table 5
Community-College Performance Indicators

AY	Grade-Point Ratios	Credits-Earned Ratios	Course-Completion Ratios	A.A. Graduation Rates	A.S. Graduation Rates
1985 - 86	2.6	68.0	87.1	36.4	56.4
1986 - 87	2.7	67.2	88.0	34.7	57.7
1987 - 88	2.6	68.2	89.3	30.5	59.7
1988 - 89	2.7	69.3	89.9	27.5	58.8
1989 - 90	2.7	70.3	90.1	26.4	60.5
1990 - 91	2.7	69.1	89.5	24.4	62.2
1991 - 92	2.7	68.3	89.4	22.1	65.1
1992 - 93	2.5	66.3	87.1	20.8	64.6
1993 - 94	2.6	69.5	88.0	19.9	61.0
1994 - 95	2.6	69.1	88.7	19.4	59.5
1995 - 96	2.6	70.4	88.8	20.0	60.1
1996 - 97	2.6	70.6	89.1	21.1	61.0
1997 - 98	2.6	71.1	89.7	22.5	58.7
1998 - 99	2.6	70.1	89.6	24.1	46.0

Figure 11
Community-College Credit-Earned Ratios

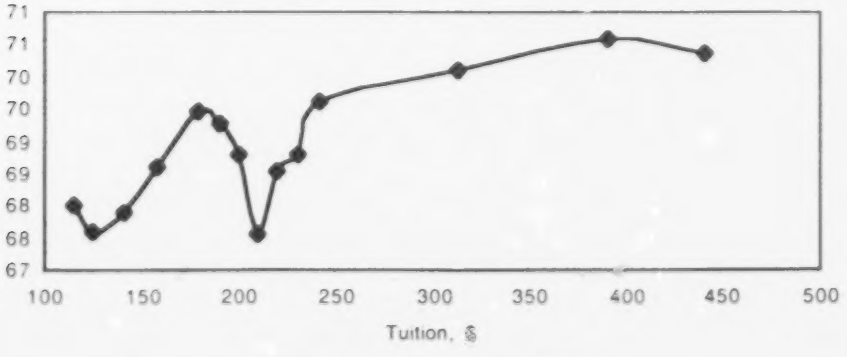


Figure 12
Liberal Arts Course-Completion Ratios

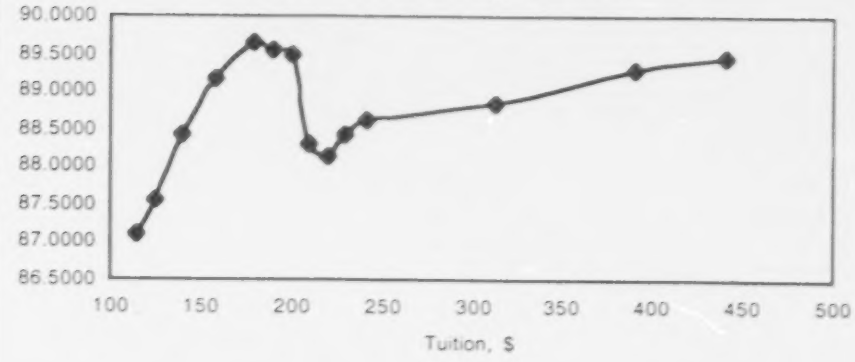


Figure 13
A.A. Graduation Rates

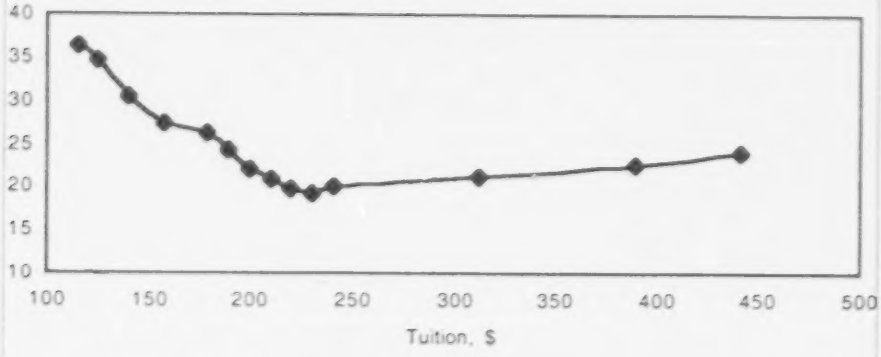


Figure 14
A.S. Graduation Rates

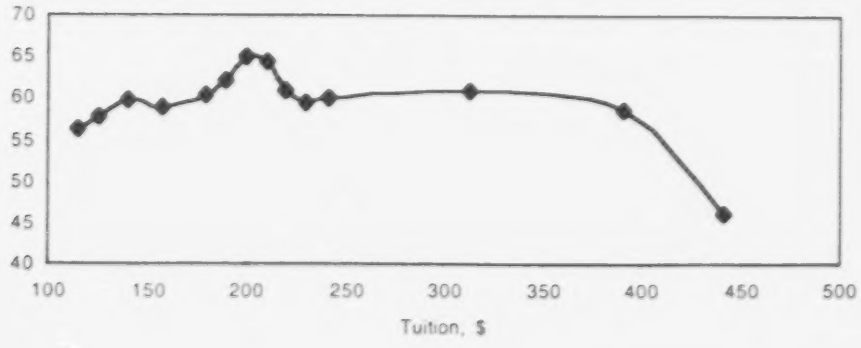


Table 6
Senior-Institution Performance Indicators

AY	Freshman Grade-Point Ratios	Sophomore Grade-Point Ratios	Lower-Division Credits-Earned Ratios	Lower-Division Course-Completion Ratios	Graduation Rates	One-Year Retention Rate
1985 - 86	2.6	2.6	89.9	97.6	13.7	N.A.
1986 - 87	2.6	2.8	90.3	97.5	13.7	N.A.
1987 - 88	2.5	2.6	86.8	97.7	13.7	82.7
1988 - 89	2.6	2.7	89.3	97.4	13.4	82.5
1989 - 90	2.5	2.7	90.2	97.5	13.2	82.1
1990 - 91	2.5	2.7	89.3	97.3	12.9	82.7
1991 - 92	2.5	2.7	88.8	97.2	12.7	80.9
1992 - 93	2.4	2.7	88.9	97.4	12.7	82.3
1993 - 94	2.5	2.7	88.9	97.3	12.7	79.6
1994 - 95	2.5	2.7	87.6	96.4	12.9	79.6
1995 - 96	2.6	2.7	88.8	96.2	13.5	79.8
1996 - 97	2.6	2.8	89.2	96.6	14.0	78.9
1997 - 98	2.6	2.7	89.4	96.5	14.3	82.3
1998 - 99	2.6	2.7	88.3	96.3	14.5	N.A.

Figure 15
Lower-Division Credit-Earned Ratios

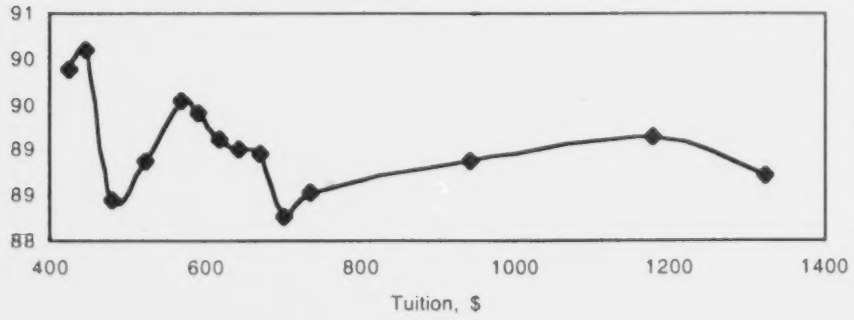


Figure 16
Undergraduate Course-Completion Ratios

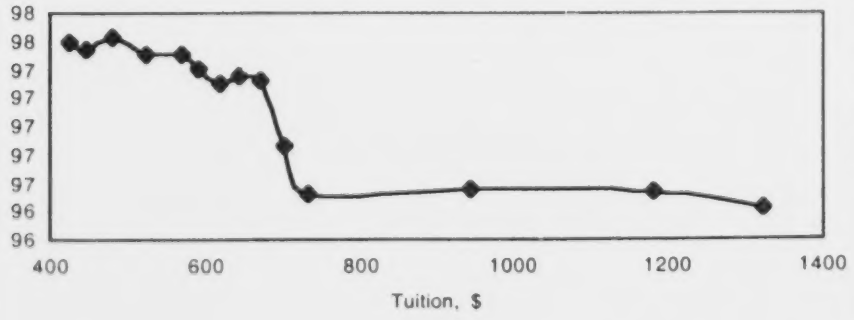


Figure 17
Freshman Grade-Point Ratios

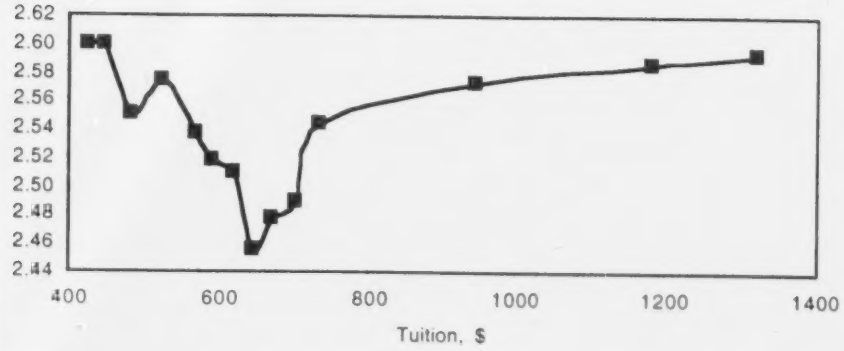


Figure 18
Sophomore Grade-Point Ratios

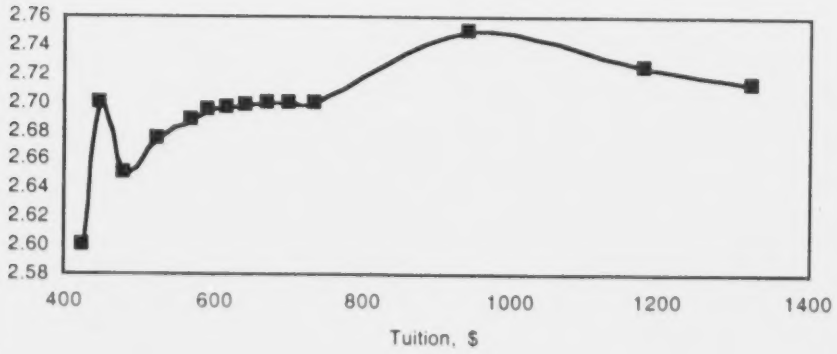
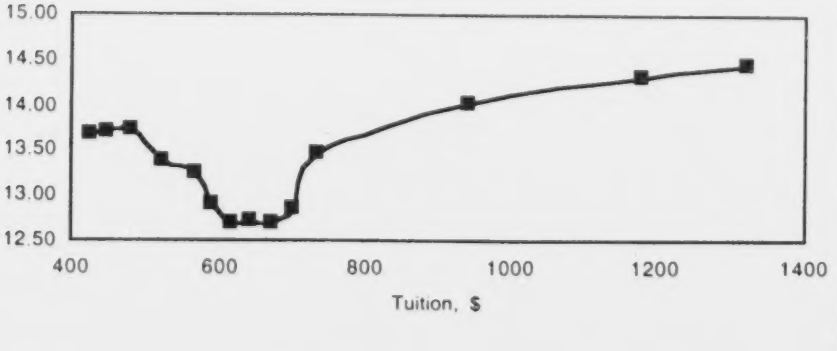


Figure 19
Graduation Rates



Community Colleges

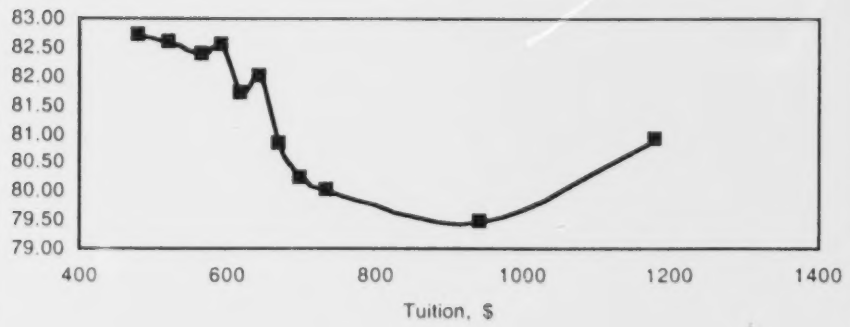
The data in Table 5 and in Figures 11, 12 and 13 indicate a performance trend that seems to be both directly proportional to that of tuition and opposite to that of demand. Trends of all indicators studied also seem to bear a remarkable resemblance to each other, starting with a fluctuation in the early period during which tuition increases slowly, and followed by improved performance starting around the $240 mark.

The data in Figure 14, which represent the Associate of Science (A.S.) graduation rates, follow a different trend. Due to the highly competitive admission process in the A.S. programs (mostly composed of select programs such as Health Sciences and Nursing), it is not expected that performance would be strongly affected by tuition increases, which is what is reflected in Figure 14. There is also another value to the different trend exhibited by the A.S. graduation rates: its presence makes it less likely that an external factor, overlooked in this study, is at play and is the one causing similarities in all the trends. We can now more confidently attribute causation to the other correlation trends observed in this study.

Senior Institution

The data in Table 6 and Figures 15 through 20 also indicate similar patterns in the performance of lower-division and graduating students. First, no specific trend appears as a function of tuition increases, then, around the figure of $750 that marks the beginning of the sharp tuition increases, a reversal is observed, showing all the performance indicators to improve. The trend observed with the one-year retention rate in Figure 20, although similar in direction, occurs at a higher tuition-dollar figure, that is, later in time. This is expected, given the one-year lag that is the nature of this indicator.

Figure 20
One-Year Retention Rates



DISCUSSION AND SUMMARY

Whether in the case of two-year or four-year institutions, the results obtained in this study seem to be generally the same. Most remarkable is the similarity in the way both demand and performance indicators reverse trends for each institution type. The results can be summarized as follows.

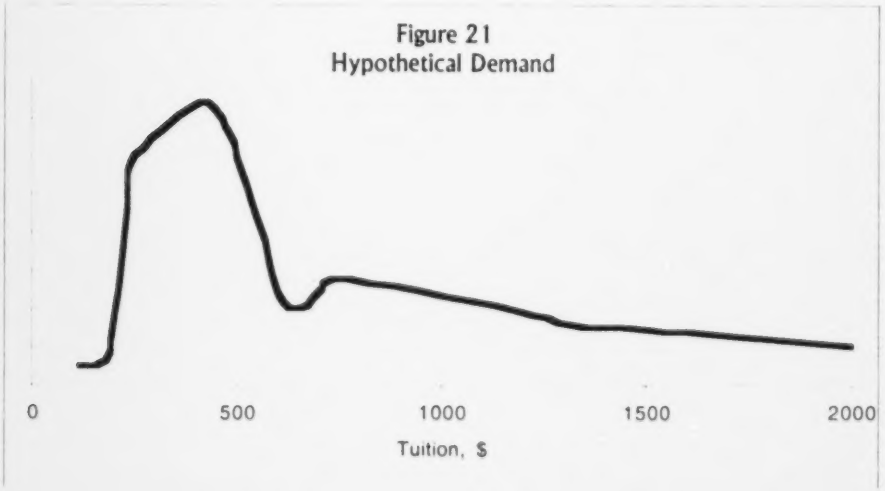
1. In terms of demand, small though recurring tuition increases —but only up to a certain point—do not lead students to interrupt their education. In this study, this threshold in tuition-increase tolerance level seems to be around $240 for the community colleges, and around $750 for the senior institution, and coincides with the beginning of the steep tuition increases. Thus, demand could be more severely impacted by a steep tuition increase than by incremental though secular ones. The tolerance level may also be a function of the initial tuition amount, which in our study amounted to roughly twice the 1985 tuition amount.

   Since eligibility for financial assistance increases with tuition, it is possible that increasing tuition does not significantly affect the financially needy. In fact, some research seems to indicate that the substantial increase in federal loans (Virginia State Dept. of Community College, 1993) has encouraged many institutions to raise tuition rapidly (Hauptman and Krop, 1998). Rather, it may be the middle class, that gap group which neither qualifies for financial assistance nor can afford painless tuition increases, which bears the brunt of these increases.

   As far as transfer, the absolute difference in tuition dollars rather than the relative tuition increase seems to be the determining factor in convincing students to transfer from the senior institution to the community colleges to complete their lower-division courses. As a result, the trend in this study has been that, all throughout the 14 years under investigation, the total gain to the senior institution from the two-way transfer traffic has been continuously decreasing.

   Based on these results, it is tempting to extrapolate a hypothetical demand behavior by combining the data of the two-year and senior institutions. If demand at both categories of institutions was a function of the same forces, economic, competitive and environmental —which is an unsubstantiated assumption— then a continuum of demand behavior could be constructed by bridging the community-college tuition range with the senior-institution range. This extended hypothetical demand that is generic to all demand indices is shown in Figure 21.

Figure 21
Hypothetical Demand



2. Small tuition increases do not seem to have an impact on performance either performance either, as evidenced by somewhat erratic performance trends under these circumstances. Then, as tuition rises rapidly, academic performance at both types of institutions starts to improve. It may be a stretch to assume that, as advocated by Evengelauf (1987), these increases contribute to a more favorable perception of the quality of education at this institution, and hence lead to attracting better students. A more plausible conclusion is that the increased cost of education

deters students who are marginally interested in pursuing their studies, and who would not perform as well as the more seriously-interested ones. Further, it can also be assumed that those who persist become more committed because failure is costlier.

Similar to demand, a hypothetical performance behavior could be extrapolated from the combined results of the two-year and senior institutions obtained in this study. Under the same unsubstantiated assumptions laid out above, extended academic performance, generic to all performance indices, could be hypothesized to behave as shown in Figure 22. As was done with Figure 21, this figure was reconstructed by combining performance as a function of the community-college tuition range with that at the senior institution.

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